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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Yong-Geun KIM

Serial No.:	08/250,770	Examiner:	D. Yockey
Filed:	27 May 1994	Art Unit:	2108

For: METHOD AND APPARATUS FOR CONTROLLING A LIGHT SIGNAL IN ELECTROPHOTOGRAPHIC RECORDING APPARATUS

Appeal No. 1999-0344

BOARD OF PATENT APPEALS AND INTERFERENCES
2001 APR 17 PM 2:30
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The Honorable Commissioner
of Patents & Trademarks
Washington, D.C. 20231

ATTENTION: Board of Patent Appeals and Interferences

APPELLANT'S REQUEST FOR REHEARING (37 CFR §1.197(b))

Pursuant to 37 CFR §1.197(b), Appellant respectfully requests a rehearing of the above captioned appeal from the final rejection of claims 1-24.

This brief is transmitted in triplicate (37 CFR §1.192(a)).

REPLY BRIEF

I. STATEMENT OF REAL PARTY IN INTEREST

Pursuant to 37 CFR §1.192(c)(1) the real party in interest is:

SamSung Electronics Co., Ltd.
3425 Maetan-dong, Paldal-ku,
Suwon City, Kyungki-do,
Republic of Korea

II. RELATED APPEALS AND INTERFERENCES

Pursuant to 37 CFR §1.192(c)(2), there are no appeals nor interferences known to the Appellant, the Appellant's legal representative, or the Assignee (real party of interest) which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Pending claims 1-24 stand finally rejected.

IV. STATUS OF AMENDMENTS AFTER FINAL

The Amendment filed 10 December 1996 has been entered. The Amendment filed 5 February 1997 has been entered.

V. SUMMARY OF THE INVENTION

Referring to Fig. 3, data transmitting unit 10 receives the video data to be printed via data bus line 2 and converts the data received into serial of video data according to the first clock signal provided via a line 52 and,, by responding to the horizontal synchronization signal exhibiting a predetermined time interval that is fed in on line 14, transmits the converted video data through line

12. A printing control unit 20 controls the mechanism required for printing the video data by means of electrical signals and provides the beam data used to switch the light generation of light source element 68 located in the beam scanning unit 30 to the light source element via a line 32 to emit light beam 90. The beam data is obtained from the chopped video data fed in via a line 102. Also the printing control unit 20 receives and processes the beam detection signals generated by the light source element through a line 34, and provides via line 14 the horizontal synchronization signal generated by processing the beam detection signals. Note that the printing control unit 20 is generally called an engine control unit. Also, for the light source element, a semiconductor laser capable of producing 0.6 milli-Watts is used.

A chopping unit 100 is preferably constructed using an logic stage such as an AND gate having one input port coupled to receive serial video data via lead 12 from data transmitting unit 10 and a second input port coupled to receive the second clock signal via lead 62; the output port of the logic stage such as an AND gate would be coupled to printing control unit 20. During operation of the chopping unit 100, the data generated by chopping the converted video data applied through lead 12 in response to the second clock signal fed in via a lead 62, is provided to lead 102 as the chopped video data. Here, the term "chopped" means that the video data is divided according to the second clock signal. This is carried out by gating of the AND gate with the second clock signal.

A clock signal generator 40 generates local, or basic, clock signals and then, applies these clock signals to a lead 42. A first divider 50 divides the basic clock signals with a certain dividing ratio and, then provides the first clock signal to lead 52. A second divider 60 divides the basic clock signal according to dividing ratio data component of the video data received via lead 2, separated from the video data through output port 5 and fed in through a line 3 and then, provides the second

clock signal on a line 62, where, the second divider 60 may have a PWM function. An output port 5 is connected between the data bus line 2 and the line 3, and stores the dividing ratio data. Here, line 2 is normally made up of sixteen bits or thirty-two bits, and line 3, eight bits. That is, the data output device 1 such as a computer connected through the line 2, provides designated dividing ratio data as a component of the video data signal transmitted via lead 2, in accordance with the selection by the user and the printing data.

After assuming that the dividing ratio data is designated via the data output device 1, referring to Figs. 4A to 4G with an illustration describing the chopping operation carried out by the chopping unit 100, a waveform of Fig. 4E is output on the output line 102 of the chopping unit 100 if an assumption that waveforms of Fig. s 4A, 4B, 4C, and 4D are output respectively on the line 42, the line 52, the line 12, and the line 62 in Fig. 3 is given. Intervals C1, C2, and C3 in the waveform of Fig. 4C are the same as those of T1, T2, and T3 in Fig. 2. Note that the number of high pulses as shown in the intervals E1, E3 in the waveform of Fig. 4E will be larger than the number of pulses in the waveform of Fig. 4C. Also, the waveform of Fig. 4E is changed to the waveform of Fig. 4G in case the waveform of Fig. 4D changes to a waveform of Fig. 4F. That is, if the frequency of the second clock signal provided by second divider 60 to line 62 is changed by a user applying video data via lead 2 containing a dividing ratio component that is greater by a factor of two than the dividing ratio that was applied to second divider 60 to produce the second clock signal with the pulse frequency shown in Fig. 4D, the frequency of the second clock signal will be correspondingly changed to provide the waveform illustrated in Fig. 4F exhibiting a pulse frequency twice that of the second clock signal waveform illustrated in Fig. 4D; concomitantly, the frequency of the chopped video data transmitted by chopping unit 102 via line 102 also changes by a factor of two, as is illustrated by with waveform of Fig. 4G.

Accordingly, the printing control unit 20 inputs the chopped video data through the line 102 and then, printing control unit 20 outputs the beam data for switching the light source element through line 32. Here, the beam data is almost the same as that on line 102. In response to this data, light source element 68 in beam scanning unit 30 lights up to generate laser beam 90. Laser beam 90 generated by light source element 68 has a wavelength of 650 to 800 nM, generally.

Also, the faster the second clock signal operates the greater the number of chopping operations occur. As a result, the effective amount of light illuminating the photosensitive drum decreases. On the contrary, when the user designates a smaller dividing ratio data by using softwear (e.g., abstractly represented by mode selector 66) to specify the dividing ratio component of the video data transmitted via data bus 2 in order to lower the frequency of the second clock signal (i.e., to set the second frequency to a lower value), the chopped video data transmitted via line 102 has a lower pulse frequency and consequently, the amount of light emitted by source 68 increases. Accordingly, the amount of light to which each point on the photosensitive surface of the drum is exposed is increased and thus, the density of the toner is increased. In this manner, printing quality, that is, the sharpness of printed images, is determined by changing the amount of toner attached during the developing process according to the change in the amount of light emitted by light source 68 of beam scanning unit 30, and thus, the amount of light illuminating the exterior circumferential surface of the photosensitive drum. See page 11, line 1 through page 14, line 11.

VI. ISSUES

In accordance with 37 CFR §1.197(b) the original decision of the Board of Patent Appeals and Interferences appears to have misapprehended or overlooked the following points and grounds for reversal of the final rejection in rendering its original decision.

A. The original decision of the Board errs with respect to the finding of motivation to combine the applied art, *i.e.,* Fig. 1 of the present application, Tomita *et al.* 4,918,462 and Hayashi *et al.* 4,989,039, in the rejection of claim 1 under 35 U.S.C. §103.

B. The original decision of the Board errs by failing to consider the particular problem with which the inventor was involved in ascertaining the scope of the prior art.

VII. GROUPING OF CLAIMS

Claim 1 stands or falls alone. Claims 2-24 stand or fall with claim 1.

VIII. ARGUMENT

<u>Claims 1-24 are patentable under 35 U.S.C. §103 over Figs. 1 of the present application *(hereafter:* admitted prior art) in view of Tomita *et al.* 4,918,462 *(hereafter:* Tomita) and Hayashi *et al.* 4,989,039 *(hereafter:* Hayashi).</u>

A.

In explaining its agreement with the Examiner's assessment of Tomita as applied to the admitted prior art the Board refers to columns 1 and 2 of Tomita's discussion of "known problems with the prior art yielding non-uniformity of print density in accordance with various prior art approaches." The Board refers us to col. 4, lines 39-40 where Tomita indicates that the invention overcomes this non-uniformity by stating that, "unevenness in amount of adhesive toner in one dot is made extremely small." The decision fails to further elaborate on why the Board refers us to col. 4, lines 39-40. The Appellant is well aware of desires taught by Tomita and that is for "driving a solid scan type recording head capable of generating the even dot shape **by each element** and reducing the difference in density in a fine area corresponding to one dot" (emphasis added and discussed below). See col 2, lines 36-40.

Tomita drives a solid scan type recording head having a plurality of light emitting elements, *i.e.,* a plurality of light emitting diodes, arranged in an array for printing one line of data. Each of the elements have different "printing" characteristics (see Tomita col. 1, line 20 through col. 2, line 29). These different printing characteristics cause a printed line to appear to have uneven density. See col. 2, lines 47-49. Accordingly, Tomita employs the circuitry of Fig. 6 to solve the problem of uneven print density by generating different strobe patterns to be applied to respective ones of the light emitting diodes.

The admitted prior art utilizes a single light emitting element, *i.e.,* a laser diode. There has been no *prima facie* showing that the "printing" characteristic of this laser diode will change over the course of printing a line of data, thus the problem that Tomita desires to overcome is not present in the admitted prior art. That is, where the solid scan type recording head having an array comprising a plurality of light emitting diodes, each having different "printing" characteristics, cause a printed line to appear to have uneven density, a line printed with a laser diode will not have uneven density based solely on the "printing" characteristic of the laser diode.

Similarly, a page printed by the solid scan type recording head in Tomita will result in each line appearing to have uneven density, absent Tomita's solution with respect to Fig. 6, however, the admitted prior art, having a single laser diode, will print a page of even density based solely on the "printing" characteristic of the laser diode.

In particular, the strobe signal, e.g. STB1 (Fig. 8), applied to a first one of the light emitting diodes always has the same duration (T1) each time it is generated. STB1 is applied to a first AND gate of circuit 3 via pulse signal selecting circuit 7. This first AND gate is held "on" as long as STB1 and pixel data are applied thereto. Accordingly, a first pixel printed by the light emitting element driven by the first AND gate has a predetermined density. Tomita does not teach nor suggest changing the density of this first pixel. That is, the first pixel printed, as detailed above, in response

to strobe signal STB1 will have the same density each time it is printed. Strobe signal STB1 is generated based on the "printing" characteristic of the corresponding light emitting diode of array 1.

The Board's original decision, on page 5, states "it would have been obvious to the artisan to utilize such teachings [Tomita's linear array of light emitting diode teachings and the ability of the circuit in Figure r to broadly control them collectively] to control a single light emitting diode as in the admitted prior art Figure 1 device since controlling one such light emitting element is inclusive of controlling the plurality forming a linear array in accordance with Tomita's general teachings."

The error in the above statement is the implication that LED's (light emitting diodes) are equivalent to laser diodes. Although both emit light, the light emitted is different and the power required to drive each device is different. With regard to printers, the inventor's field of endeavor, one particular difference is an LED is usually turned on for a predetermined period in order to print data of a pixel, a laser diode, however, is pulsed on/off millions of time in a predetermined time period. Tomita's circuit (Fig. 6) pulses each LED of an LED array by respective strobe signals, which is supposed to increase the brightness the light emitted by the LEDs, of being made to appear brighter than others, some that problem of different printing characteristics is overcome by making the light emitted by the array appear to be constant across the array. Since a laser is already pulsed, or strobed, at a rate (frequency) much higher than that contemplated by Tomita, one of ordinary skill in the art would not have been motived by the pulsing technique in Tomita to modify the admitted prior art.

Additionally, since the laser diode of the admitted prior art will ideally print a document with even toner density throughout the document due to use of one laser diode, the problem detailed in

Tomita does not exist in the laser printer of the admitted prior art, thus there is no teaching in Tomita to suggest a need, nor advantage to be gained, by modifying the admitted prior art.

Accordingly, the holding of obviousness set forth on page 5 in The Board's original decision (set forth above) is without merit and thus fails to provide a *prima facie* basis of motivation to combine the art applied to claim 1.

On page 8, lines 10-12, the Board's decision states, "the teachings in Tomita to achieve uniformity of print density would have been, in our view, a strong motivation to the artisan to have utilized Tomita's approach and modify that of the admitted prior art Figure 1."

As we have described in detail above, the admitted prior art already has uniformity of print density. there has been no teaching to suggest otherwise. Accordingly, Tomita does not provide the strong motivation suggested by the Board.

B.

To ascertain the scope of the prior art, the field of the inventor's endeavor and "the particular problem with which the inventor was involved" must be examined. See *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 1535, 318 USPQ 871, 876 (Fed. Cir. 1983).

At the time of the invention, the problem associated with the admitted prior art was described as being directed towards the amount of toner attached on the drum during the developing stage being determined by a bias voltage wherein the intensity of the bias voltage is controlled by an adjusting terminal known as a printing density selecting switch, installed on a control panel in an external stage of the printer. A printer using this approach to control of printing density is very inconvenient to use however, because the printing density has to be adjusted for each use. Moreover, this approach requires intense, uninterrupted concentration from the user. Also, it is very hard for unskilled users to accurately and repeatedly adjust the adjustment terminal. Frequently, the

durability of the photosensitive drum in such laser printer is shortened and the toner consumption is increased when the user fails to adjust the bias voltage properly.

On page 8, lines 13-17, the Board's decision appears to disregard the above stated problem. Additionally, neither Tomita nor Hayashi address the problem with which the Appellant was involved, and the Board's decision appears to imply that this does not detract from the holding of obviousness. In fact, the basis of obviousness appears to be grounded in the misunderstanding that the admitted prior art fails to print a document of uniform print density, even though there is no teaching that the admitted prior art fails to print a document of uniform print density.

In the admitted prior art, it should be understood, as it is well known in the art, that a laser printer has high resolution and prints a document with even toner density. The user's changing of the bias voltage merely changes the density of the toner on the printed document, not the uniformity of density. Hayashi teaches that a change in humidity may effect the print density in a laser printer, whereas Tomita is silent with regard to the effect of print density with respect to any change in environmental conditions (such as humidity). Since a change in humidity does not occur at an short instant in time, such as the time required to print a page, then the print density of a page being printed by the apparatus of Figure 1 of the admitted prior art will not change, and the known uniformity of print density associated with laser printers will still exist in the admitted prior art.

Further, the printing page of image data printed one day may appear darker (or lighter) to that printed on another day due to a change in humidity. Hayashi's invention is intended to overcome this problem. Accordingly, one of ordinary skill in the art would have been motivated by Hayashi to modify the apparatus of the admitted prior art so that the user would not have to try, by experimentation, to adjust the bias voltage in order achieve this desired uniformity in printing of multiple documents. Hayashi provides no teaching which would have suggested modification of the admitted prior art in view of the teachings in Tomita.

For the foregoing reasons it is deemed that there is no tenable motivation for combining Appellant's Prior Art Fig. 1, Tomita and Hayashi as proposed by the rejection. Accordingly, the Board's decision should be reversed and the rejection should not be sustained.

No fee is incurred for filing this brief. Should the check become lost, be deficient in payment, or should any fees be incurred, the Commissioner is authorized to charge Deposit Account No. 02-4943 of Applicant's undersigned attorney in the amount of such fees.

Respectfully submitted,

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IX. APPENDIX

CLAIMS UNDER APPEAL

1. An electrophotographic developing type reproduction apparatus, comprising:

data transmitting means for generating converted data by converting input data, to be printed as video data, in accordance with a first clock signal, and for transmitting the converted data in response to a horizontal synchronization signal exhibiting a predetermined time interval;

chopping means for providing chopped data by dividing the converted data from said data transmitting means in accordance with a second clock signal; and

printing control means for providing beam data in response to said chopped data, for controlling printing of the video data by generating electrical signals to control generation of a laser beam by a light source element;

said print control means generating said horizontal synchronization signal in correspondence with a beam detection signal derived from the laser beam by the light source element.

2. The electrophotographic developing type reproduction apparatus of claim 1, further comprised of the second clock signal having a frequency greater than the first clock signal.

3. The electrophotographic developing type reproduction apparatus of claim 1, further comprised of a frequency of the second clock signal being an integer multiple of a frequency of the first clock signal.

4. The electrophotographic developing type reproduction apparatus of in claim 1, further comprised of said chopping means comprising an AND gate having a first input port coupled to receive said converted data and a second input port coupled to receive said second clock signal.

5. The electrophotographic developing type reproduction apparatus of claim 1, further comprised of mode selecting means for enabling a user to change a characteristic of said second clock signal.

6. The electrophotographic developing type reproduction apparatus of claim 1, further comprised of a semiconductor laser device serving as the source element.

7. The electrophotographic developing type reproduction apparatus of claim 1, comprised of:

first means for generating a local clock signal; and

second means for generating said second clock signal by dividing said local clock signal in response to a dividing ratio component accompanying said input data.

8. The electrophotographic developing type reproduction apparatus of claim 1, comprised of:

means for generating a local clock signal;

first means for generating said first clock signal by dividing said local clock signal; and

second means for generating said second clock signal by dividing said local clock signal in dependence upon a dividing ratio component of said input data.

9. The electrophotographic developing type reproduction apparatus of claim 1, comprised of said chopping means intermittently transmitting said serial video data during pulses of said second clock signal.

10. The electrophotographic developing type reproduction apparatus of claim 1, comprised of:

a component of said input data specifying a dividing ratio; and

means for setting a frequency exhibited by said second clock signal in dependence upon said component.

11. The electrophotographic developing type reproduction apparatus of claim 1, comprising:

a component of said input data specifying a dividing ratio;

means for setting a frequency exhibited by said second clock signal in dependence upon said component; and

said chopping means dividing said converted data into a series of pulses exhibiting a pulse frequency corresponding to said frequency exhibited by said second clock signal.

12. A method for controlling a laser signal in an electrophotographic developing type reproduction apparatus, said method comprising the steps of:

generating converted data by converting input data to be printed into video data, in accordance with a first clock signal, and for transmitting the converted video data in response to a horizontal synchronization signal exhibiting a predetermined time interval;

generating chopped data by dividing the converted data in dependence upon a second clock signal;

supplying beam data for controlling generation of said laser signal by a light source element in response to said chopped data; and

generating said horizontal synchronization signal in dependence upon a beam detection signal obtained by detecting said laser signal.

13. The method of claim 12, comprising the second clock signal having a frequency higher than the first clock signal.

14. The method of claim 12, comprising a frequency of the second clock signal being an integer multiple of a frequency of the first clock signal.

15. The method of claim 12, comprised of generating the chopped data by applying the converted data to a first input port of an AND gate data and applying the second clock signal to a second input port of the AND gate.

16. The method of claim 15, comprised of changing a characteristic of the second clock signal in response to a selection made by a user of the reproduction apparatus.

17. An apparatus for printing video data, comprising:

data bus means having a first data line for providing input video data and a second data line for providing dividing ratio data;

clock signal generating means for generating a first clock signal and for generating a second clock signal, said second clock signal exhibiting a characteristic depending upon said dividing ratio data;

data transmitting means for converting said input video data into serial video data in response to said first clock signal, and for transmitting said serial video data in response to a horizontal synchronization signal;

logic means for providing chopped video data in dependance upon said serial video data and said second clock signal;

printing control means for generating beam data in response to said chopped video data; and

beam scanning means for providing a laser beam for defining images corresponding to said beam data;

said beam scanning means generating a beam detection signal derived from scanning of said laser beam;

said printing control means generating said horizontal synchronizing signal in dependence upon said beam detection signal.

18. The apparatus of claim 17, comprised of generating said first clock signal with a frequency less than said second clock signal.

19. The apparatus of claim 17, comprised of generating said first clock signal with a frequency equal to said second clock signal.

20. The apparatus of claim 17, comprised of said clock signal generating means comprising means for changing said characteristic of said second clock signal in correspondence with changes in said dividing ratio data.

21. The apparatus of claim 17, comprised of said clock signal generating means comprising:

first means for generating a local clock signal; and

second means for generating said second clock signal by dividing a frequency of said local clock signal in dependence upon said dividing ratio data.

22. The apparatus of claim 17, comprised of said clock signal generating means comprising:

means for generating a local clock signal exhibiting a first plurality of pulses characterized by a local frequency;

first means for generating said first clock signal by dividing pulses of said local clock signal to provide a second plurality of pulses characterized by a second frequency; and

second means for generating said second clock signal by dividing said pulses of said local clock signal in dependence upon said dividing ratio data, to provide a third plurality of pulses characterized by a third frequency established in dependence upon said dividing ratio data.

23. An apparatus for printing video data, comprising:

data bus means having a first data line for providing input video data and a second data line for providing dividing ratio data;

clock signal generating means for generating a first clock signal and for generating a second clock signal, said second clock signal exhibiting a characteristic depending upon said dividing ratio data, said clock signal generating means comprising:

means for generating a local clock signal exhibiting a first plurality of pulses characterized by a local frequency;

first means for generating said first clock signal by dividing pulses of said local clock signal to provide a second plurality of pulses characterized by a second frequency; and

second means for generating said second clock signal by dividing said pulses of said local clock signal in dependence upon said dividing ratio data, to provide a third plurality of pulses characterized by a third frequency established in dependence upon said dividing ratio data;

data transmitting means for converting said input video data into serial video data in response to said first clock signal, and for transmitting said serial video data in response to a horizontal synchronization signal;

logic means for providing chopped video data in dependance upon said serial video data and said second clock signal;

printing control means for generating beam data in response to said chopped video data; and

beam scanning means for providing a laser beam for defining images corresponding to said beam data and for generating a beam detection signal derived from scanning of said laser beam;

said printing control means generating said horizontal synchronizing signal in dependence upon said beam detection signal.

24. A method for controlling a laser signal in an electrophotographic developing type reproduction apparatus, said method comprising the steps of:

generating converted data by converting input data to be printed into video data, in accordance with a first clock signal, and for transmitting the converted video data in response to a horizontal synchronization signal exhibiting a predetermined time interval;

generating chopped data by dividing the converted data in dependence upon a second clock signal, the second clock signal having a frequency higher than the first clock signal wherein the second clock signal being an integer multiple of a frequency of the first clock signal, the chopped data being generated by applying the converted data to a first input port of an AND gate data and applying the second clock signal to a second input port of the AND gate, said chapped data being output from an output port of said AND gate;

changing a characteristic of the second clock signal in response to a selection made by a user of the reproduction apparatus;

supplying beam data for controlling generation of said laser signal by a light source element in response to said chopped data; and

generating said horizontal synchronization signal in dependence upon a beam detection signal obtained from said laser signal.